

What is claimed is:

1. An ion implantation system suitable for use in implanting ions into one or more workpieces comprising:
  - an ion source for producing a quantity of ions which can be extracted in the form of an ion beam, the ion beam having a beam current;
  - a beamline assembly downstream of the ion source to receive and direct the beam of ions;
  - an end station downstream of the beamline assembly to hold the one or more workpieces toward which the ion beam is directed;
  - a component downstream of the ion source for modulating the ion beam current; and
  - a measurement component for taking readings of beam current, the modulating component adjusting the beam current in response to readings taken by the measurement component.
2. The system of claim 1, wherein the modulating component comprises one or more plates of an ion beam accelerator.
3. The system of claim 1, wherein the modulating component comprises a ground electrode.
4. The system of claim 1, wherein the modulating component comprises a set of electrically conductive plates located between the ion source and the beamline assembly.
5. The system of claim 1, wherein the beamline assembly includes an analyzer magnet to mass resolve ions within the beam, the modulating component

comprising an electrode downstream of the analyzer magnet.

6. The system of claim 1, wherein the modulating component comprises a set of electrically conductive plates defining a resolving aperture of the beamline assembly.

7. The system of claim 1, wherein the modulating component comprises an electrode located downstream of a resolving aperture of the beamline assembly.

8. The system of claim 1, wherein the modulating component comprises a source of plasma operable to neutralize a positive charge that may otherwise accumulate on the one or more workpieces.

9. The system of claim 1, wherein the modulating component comprises a set of deflection electrodes.

5 10. The system of claim 1, wherein the modulating component comprises an extraction suppression electrode located close to the ion source.

10 11. The system of claim 1, wherein the modulating component comprises a source magnet that assists with generating ions within the ion source, the source magnet located close to the ion source.

12. The system of claim 1, wherein the modulating component comprises a mechanical structure that selectively blocks a portion of the ion beam.

15 13. The system of claim 1, wherein the measurement component is utilized

in developing implantation waveforms that are employed in modulating the beam current.

5        14. The system of claim 12, wherein the measurement component comprises at least one of a Faraday cup and terminal return current.

10      15. The system of claim 1 further comprising a controller for selectively controlling the modulating component in response to readings taken by the measurement component.

15      16. The system of claim 1, wherein the beam current is modulated between at least one of a frequency of about 1 - 1000 Hz and a range of about 10 - 20% of the beam current.

20      17. The system of claim 1, wherein the measurement component takes readings of beam current during the ion implantation process to facilitate feedback or closed-loop adjustments to the beam current.

18. The system of claim 1, wherein the measurement component takes readings of beam current prior to the ion implantation process to facilitate open loop adjustments to the beam current.

19. An ion implantation system suitable for use in implanting ions into one or more workpieces comprising:

an ion source for producing a quantity of ions which can be extracted in the form of an ion beam, the ion beam having a beam current;

a beamline assembly downstream of the ion source to receive and direct the

beam of ions;

an end station downstream of the beamline assembly to hold the one or more workpieces toward which the ion beam is directed;

a component downstream of the ion source for modulating the ion beam current; and

a measurement component for taking readings of beam current at one or more points during ion implantation, the modulating component adjusting the beam current in response to readings taken by the measurement component,

wherein the modulating component includes at least one of one or more plates of an ion beam accelerator, a ground electrode, a set of electrically conductive plates located between the ion source and the beamline assembly, and electrode downstream of an analyzer magnet within the beamline assembly that mass resolves

5 ions within the beam, a set of electrically conductive plates defining a resolving aperture of the beamline assembly, an electrode located downstream of a resolving aperture of the beamline assembly, a source of plasma operable to neutralize a positive charge that may otherwise accumulate on the one or more workpieces, a set of deflection electrodes, an extraction suppression electrode located close to the ion source, a mechanical structure that selectively blocks a portion of the ion beam, and a source magnet that assists with generating ions within the ion source, the source magnet located close to the ion source.

10 20. The system of claim 19, wherein the measurement component is utilized in developing implantation waveforms that are employed in modulating the beam current.

15 21. The system of claim 20, wherein the measurement component comprises at least one of a Faraday cup and terminal return current.

22. An acceleration system suitable for use in implanting ions into a workpiece comprising:

an ion source for producing a quantity of ions which can be extracted in the form of an ion beam, the ion beam having a beam current;

a beamline assembly downstream of the ion source to receive and direct the beam of ions;

an end station downstream of the beamline assembly to hold one or more workpieces onto which the ion beam is directed;

5 a first modulating component associated with the ion source for modulating the beam current; and

a second modulating component downstream of the ion source for selectively modulating the ion beam current.

23. The system of claim 22, wherein the first modulating component  
10 comprises a source magnet that assists with producing ions within the ion source.

24. The system of claim 22 further comprising:  
a measurement component for taking readings of beam current at one or more points during ion implantation; and

15 a controller operatively coupled to the measurement component, the controller selectively adjusting at least one of the first modulating component and the source magnet.

25. The system of claim 22, wherein the second modulating component  
20 comprises one or more electrically conductive members situated along the beam path.

26. The system of claim 22, wherein the second modulating component further comprises at least one of a source of plasma operable to neutralize a positive charge that may otherwise accumulate on the one or more workpieces and a mechanical structure that selectively blocks a portion of the ion beam.
- 5